III. REMARKS

In the Office Action, claims 1-6 and 9-10 were rejected under 35 U.S.C. 103 as being unpatentable over Applicant's admitted prior art in view of Heck (US 5079526), and claims 7-8 were rejected under 35 U.S.C. 103 as being unpatentable over Applicant's admitted prior art in view of Heck and further in view of Rapeli (US 6510313) for reasons set forth in the Office Action.

The following argument is presented to overcome the foregoing rejections and to show the presence of allowable subject matter in the claims.

The invention relates to the construction of direct conversion receivers. As noted in the present specification (page 2, beginning at line 11), in such receivers the pure carrier signal give rise to a DC signal at the output of a mixer. Also, with respect to disadvantages of the prior-art systems, other undesired signals at the mixer input give rise to mixing products of which the spectrum is located in the vicinity of DC. The specification (beginning at line 30) teaches further that the DC offset voltages have a large dynamic range relative to the useful signal spectrum, resulting in amplifier saturation or problems with analog-to-digital conversion. The specification mentions various techniques employed in the prior to deal with these disadvantages of the direct conversion receiver.

As noted on page 3 of the specification, an object of the present invention is to provide for processing of received radio signals, by means of a direct conversion receiver, wherein the signals are modulated and centered at a carrier frequency. The

invention overcomes problems of the prior art by providing the advantages disclosed in the specification (page 3 at lines 21-28). The invention make use of properties of the spectrum of the incoming radio signal, which signal is a digitally modulated signal having a stream of bits of 1's and 0's, and having a modulation such a PSK (phase shift keying), and wherein the spectrum is characterized by a main lobe at the carrier frequency (present specification (page 1 at lines 2-23).

The spectrum of the received radio signal is described further in the specification (page 5 at lines 11-30) in conjunction with the graph of Fig. 1. The horizontal frequency scale is normalized to correspond to the chip rate, which is the reciprocal of the time duration of a bit of the digitally modulated signal. This format of the horizontal frequency scale shows a main lobe and a sequence of side lobes separated by null points, or notches, the null points being located at multiples of the chip rate. This type of spectrum is associated with a GPS (Global Positioning System) using CDMA (Code Division Multiple Access), as taught in the present specification (page 4 at lines 20-29).

In the practice of the present invention (specification at page 3, beginning at line 30 through page 4 at line 7), a local oscillator outputs a value of mixing frequency that is offset from the value of the carrier frequency. The magnitude of the frequency offset is equal to the difference between the carrier frequency and a null frequency of the received signal spectrum. Thereby, upon a mixing of the signal of the local oscillator with the incoming modulated radio signal, the frequency spectrum of the modulated signal is repositioned to align the DC to a spectral null point. This choice of the frequency offset enables

one to successfully construct the present receiver, as shown in Fig. 2, and to obtain the advantages discussed on page 4 of the specification.

In the rejection of the claims, the examiner cites the description of the prior art, provided by the Applicant, in conjunction with the teachings of Heck, as the primary reference. The examiner observes (bottom of page 2 of the Office Action) that Heck teaches the offsetting of a local oscillator frequency by a modulating frequency 124 (shown at the right side of Fig. 1 and demonstrated in the receiver of Fig. 5).

A study of the Heck patent shows that Heck provides instructions for the construction of circuitry that will enable one to construct a frequency modulated synthesizer using low frequency offset mixed VCO (Title and Abstract). The basic circuitry is shown in Fig. 1. Figs. 2 and 3 show respectively a mixer and an oscillator for use in the circuitry of Fig. 1. Figs. 4A and 4B provide further information in the construction of a VCO. Figs. 5 and 6 describe respectively a receiver and a transmitter utilizing principles taught by the preceding figures and their accompanying text. There is a general discussion of spectral concepts relating to the circuits of Figs. 5-6 by Heck in column 6 at lines 12-35.

However, nowhere in Heck is there a picture of the spectrum, such as that of present Fig. 1, nor is there a description of providing an offset mixing frequency wherein the amount of the offset is based on the location of a notch between lobes of the spectrum of a digitally modulated PSK signal, or similar signal to be received. In Heck, the modulating frequency 124 of his modulator is not analogous to the chip rate of a GPS receiver,

and the examples of values of frequency given by Heck (100 to 300 kHz indicated in column 3 at line 32) is much different from the chip rate of 1.023 MHz (or multiples thereof) disclosed in the present specification in relation to a GPS receiver.

In the practice of the present invention, it is noted that basing the offset on the chip rate brings the intermediate frequency to a spectral area where signal energy is minimal. This is of no concern in Heck whose teaching is applicable to a system with no signal energy at zero IF. In contrast, the present invention is practiced with signals having spectra such as or similar to the GPS signal wherein the main signal energy is at DC and there is an absence of energy at the notch frequencies. Also it appears that the Heck circuitry would not operate for reception of a signal having the spectrum of an FM signal.

It is urged that the examiner has presented a reference showing the mechanics of offsetting a frequency, but has not provided a teaching of the present invention directed to the amount of an offsetting of frequency based on the frequency value of a notch in a multiple lobed spectral pattern of a digitally modulated signal for reception of the signal.

Present claim 1 recites steps of filtering out certain DC components of baseband signals centered at zero frequency. It appears that this specific filtering is not disclosed in the Background data of the present specification nor in Heck. Claim 1 also recites a step of setting a local oscillator frequency to a value of a carrier plus an offset related to a notch of a sideband. This is not taught in the Background section of the present specification, nor does it appear to be taught in Heck.

This observation applies also to the other ones of the present independent claims. Accordingly, it is believed that the present claims are distinguishable from the combined teachings of the foregoing referenced art cited by the examiner, so as to have allowable subject matter.

In order to emphasize the foregoing distinctions between the cited art and the present invention, new independent claims 11 and 12, corresponding to claims 1 and 2, are presented. Claims 1 and 12 provide further definition of the amount of offset in the offset frequency. Also new claims 13 and 14 are presented for further definition of the invention.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issues remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

A check in the amount of $1250.00 is enclosed for a two-month extension of time and four additional independent claims. The Commissioner is hereby authorized to charge payment for any fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,

Geza C. Ziegler, Jr.
Reg. No. 44,004

17 November 2005
Date

Perman & Green, LLP
425 Post Road
Fairfield, CT 06824
(203) 259-1800
Customer No.: 2512

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